

REMARKS

The Office Action of April 5, 2007, is discussed in detail below.

Amendments to the Claims

Applicant has amended independent claims 1, 20, 30, 41, and 47 to recite that the dielectric layer formed on the conductive layer formed on the sidewall surface of the opening contacts the bottom surface of the opening. Support for these amendments may be found, for example, in Figures 1 and 2 of Applicant's specification.

Applicant has amended claims 62, 67, 71, and 75 to correct a typographical error.

Applicant has added new claims 88 – 92 to recite that the conductive layer that is formed on the sidewall of the opening in the dielectric layer contacts the bottom surface of the opening. Support for these amendments may be found, for example, in Figures 1 and 2 of Applicant's specification.

Applicant has added new claims 93 – 97 to recite that the dielectric layer that is formed on the conductive layer formed on the sidewall of the opening in the dielectric layer fills the opening. Support for these amendments may be found, for example, in Figures 1 and 2 of Applicant's specification.

Claim Rejections – 35 USC §103**From Paragraph 4 of the Office Action:**

Claims 1, 7 - 9, 16 - 23, 25 - 26, 29 - 33, 35 - 36, 39 - 53, 58 - 60, 63 - 65, 68 - 69, and 72 - 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morishita (US 5,529,956) in view of Harshfield (US 6,031,287).

U.S. Patent 5,529,956 to Morishita ("Morishita") discloses a method of making an electrical contact element that includes the steps of providing a first dielectric material with an opening having a sidewall surface and a bottom surface; forming a conductive layer on the sidewall surface and a portion of the bottom surface; forming a second dielectric layer over the conductive layer and at least a portion of the bottom surface, and forming an upper level wiring conductor in electrical communication with the conductive layer. Morishita, however, fails to teach a programmable resistance material, phase-change material, or chalcogenide material in electrical communication with the conductive layer.

U.S. Patent 6,031,287 to Harshfield ("Harshfield") teaches the formation of a phase-change programmable resistance material in contact with a conductive layer formed on the sidewall surface and a complete portion of the bottom surface of an opening in a dielectric layer. Examiner maintains that it would be obvious to one of skill in the art to combine the phase-change programmable resistance material of Harshfield with the electrical contact structure of Morishita to achieve Applicant's invention.

Applicant's amended claim 1 recites a method of making an electrically programmable memory element that includes the steps of providing a first dielectric layer having an opening with a sidewall surface and a bottom surface, forming a conductive layer on the sidewall surface

and a portion of the bottom surface that is less than all of the bottom surface, forming a second dielectric layer on the conductive layer that contacts the bottom surface of the opening, and forming a programmable resistance material in electrical communication with the conductive layer.

Applicant respectfully submits that Morishita in view of Harshfield fails to teach a method of making an electrically programmable memory element that includes Applicant's claimed step of forming a second dielectric layer over a conductive layer formed on the sidewall surface of a dielectric opening, where the second dielectric layer contacts the bottom of the opening. Applicant notes that in Morishita, second conducting film 10 is formed on the sidewall surface and a portion of the bottom surface of the opening present in interlayer insulating film 4 and that second insulating film 11 is formed over second conducting film 10. Second insulating film 11, however, fails to contact the bottom surface of the opening present in interlayer insulating film 4. (See Figure 1E of Morishita) Similarly, conductive layer 124 of Harshfield is formed on the sidewall surface of the opening in dielectric layer 110 and dielectric material 122 is formed over conductive layer 124. Conductive layer 124, however, complete covers the bottom surface of the opening in dielectric layer 110 so that dielectric material 122 does not make contact with the bottom surface.

Applicant accordingly maintains that the combination of Morishita and Harshfield fail to teach each and every element of Applicant's amended claim 1 and that this rejection has been overcome. Applicant further maintains that independent claims 20, 30, 41, and 47 in their amended form similar overcome the rejection based on Morishita in view of Harshfield. Applicant respectfully believes that the rejection of claims 1, 20, 30, 41, 47, and claims 7 - 9, 16

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– 23, 25 – 26, 29 – 33, 35 – 36, 39 – 53, 58 – 60, 63 – 65, 68 – 69, and 72 – 73 that depend therefrom, has been overcome and respectfully requests that these rejections be removed.

Claim Rejections – 35 USC §103

From Paragraph 4 of the Office Action:

Claims 61 – 62, 66 – 67, 70 – 71, and 74 – 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morishita and Harshfield as applied to claims (20, 40, 41, 47) above and further in view of Nagashima (US 5,312,773).

Applicant respectfully submits that this rejection is overcome for the reasons described above because the combination of Morishita and Harshfield, fails to teach Applicant's claimed second dielectric layer that contacts the bottom of the opening of the first dielectric layer. The modification of the conductive layer to a dual layer structure as taught in U.S. Patent 5,312,773 to Nagashima ("Nagashima") does not overcome deficiency of the combination of Morishita and Harshfield. Applicant accordingly submits that this rejection is overcome and that claims 61 – 62, 66 – 67, 70 – 71, and 74 – 75 as dependent on amended claims 20, 40, and 47 are allowable.

SUMMARY

The remaining claims in the application are claims 1, 7 - 9, 16 - 23, 25 - 26, 29 - 33, 35 - 36, 39 - 53, 58 - 75, and 88 - 92. In view of the above amendment and argument, Applicant believes that the rejections of these claims have now been overcome and that these claims stand in a condition for allowance. Applicant further believes that new claims 88 - 97 are allowable as presented. Applicant respectfully requests withdrawal of all outstanding rejections and respectfully submits that the application stands in condition for allowance. If the Examiner has any questions or suggestions regarding this amendment, the Examiner is respectfully asked to contact Applicant's representative at the telephone number or email address listed below.

Respectfully submitted,



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